

# The Strategic Management of Energy Service Company to Enhance the Sustainable Energy Management in Thailand

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**Abstract-** Thailand imports a large portion of crude oil which equals to 16.3 % of GDP in 2011 for driving the growth of Thailand economy. Several countermeasures are developed from various fields of responsibility in order to provide the sufficient and sustainable energy policy. This paper reviews the development of energy service company (ESCO) in Thailand which is expected to be an important player for the policy of energy conservation and efficiency. In addition, the strategic management of ESCO under the roles of Thai government, private organizations and ESCOs are also analysed with the current countermeasures and the future trend measures by considering three options of energy performance contracting (EPC). The results of analysis show that the strategic management of ESCO mainly depends on the directive of Thai government especially the enforcement of law and regulation. The ESCO with guaranteed saving contract will be dominant player if the law and regulation are effectively enforced in the future. Moreover, the ESCO with shared saving contract will be the highest feasibility under the fully supported financial; however, the participation of the ESCO with consultant contract will decrease with significant level. Finally, the strategic management of ESCOs and opportunities in Thailand is presented.

**Keywords-** *Energy Service Company (ESCO); Strategic Management; Energy Performance Contracting; Energy Conservation Promotion Act No. 2 2007 (B.E. 2550) and Demand Side Management Bidding Mechanism*

## I. INTRODUCTION

One of important factors to develop and drive the growth of world economy is energy. The world energy consumption has continuously increased while the traditional energy resources especially fossil fuels are rapidly depleted. Likewise, Thailand is a country which the energy consumption is rapidly raised. The situation of high dependency on imported energy will make Thailand at the risk of energy supply disruption and volatility of energy price. The first energy crisis in Thailand was found in 1973 during the world crude oil crisis, and then the gulf war between Iraq and Kuwait that caused the oil shortage in 1990. The successive standard measures were launched by government including energy law and regulation to enhance the energy management in Thailand which was considered as the effective tools for reducing the effect of energy crisis. The first energy law, the Energy Conservation Promotion Act B.E. 2535 (1992) or ECP, was announced in 1992 which proposed to be the national regulatory framework for energy conservation actions. The main objective for the first era of energy management in Thailand was the encouraging energy conservation projects with using an incentive and subsidized mechanism from the government sector. Furthermore, the government had continuously developed the 1<sup>st</sup> period of

energy conservation plan which was effective encouraging during 1995-1999. For the next time, the 2<sup>nd</sup> energy conservation plan was expanded during 2000-2004 according to the acceptable successful of the first one. However, the 2<sup>nd</sup> energy conservation plan was replaced by the energy conservation strategy in 2002 since the energy issue was proposed to be a part of the national agenda. The strategic management was firstly considered on the energy management to guarantee the achievement of the national goal. The high potential measures were researched and developed to be common standard measures under the acceptable risk level by private organization perspectives. The revolution of energy conservation programs in Thailand from 1992-2009 is illustrated in Fig. 1. From the past to present, the government strategy related energy saving and energy policy had been changed from several factors. The major obstructions of this policy was from the master plan or long term planning for national energy efficiency was not well developed while a political was uncertainty. Further, a law and regulations of energy conservation cannot be effective in practical. For the target sector such as large scale commercial and industrial sectors, the energy saving or conservation programs were less important when compared to a value added of production or services. During the time of uncertain energy efficiency policy in Thailand, a rapid development of high efficiency equipment was continued to utilized particular in developed countries. For example, high efficiency technologies of variable speed drive to optimize and to control an operation of motors, a highest energy intensive, were taken into the energy efficiency for industrial sector. In addition, high technology of lighting system, heating and air conditioning system and energy monitoring system have been widely utilized in commercial sector. The results of success implementing energy efficiency of large energy consumers in several countries lead to the improvement of energy utilization indicators. In order to achieve a sustainable of energy efficiency policy especially in large energy consumers, the energy policy from the government at the end of 2008 in Fig. 2 had been established. The directions of long term national energy planning were driven by five strategies. This policy had announced covering energy security, alternative energy, energy prices supervision, energy conservation and efficiency and environment impacts. For energy conservation strategy, the energy service company (ESCO) is one of the key players which are expected to support activities of this energy policy in order to meet the expected target <sup>[1]</sup>. ESCO is a business company providing a turnkey energy services with performance based contracting to energy users. In general, activities of ESCOs can be involved a circle of energy management system including supplying and installation of

energy efficiency equipment, refurbishment, maintenance and

operation and facility management.

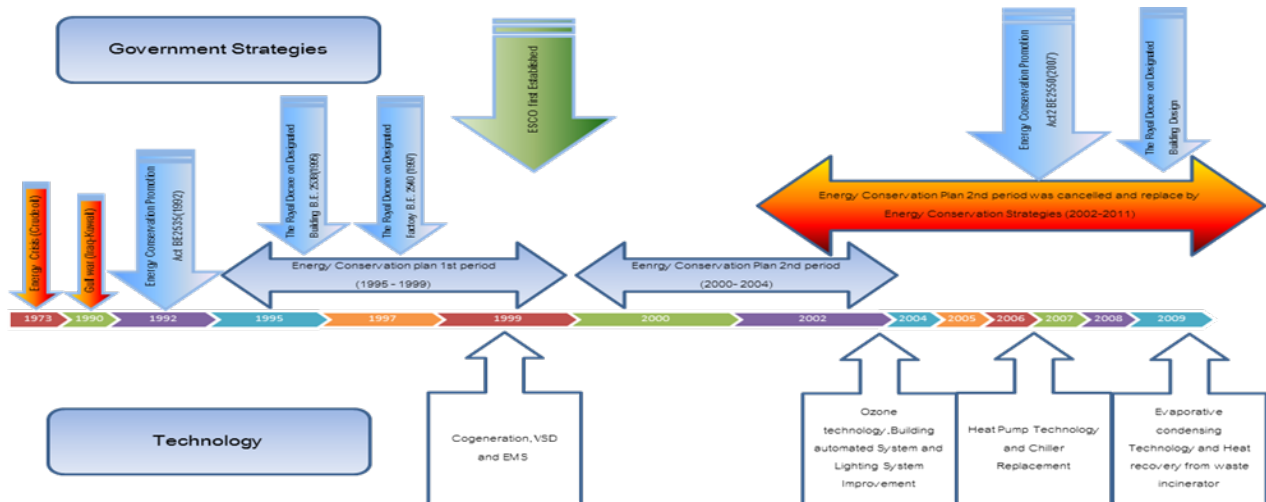


Fig. 1 The timeline of energy conservation programs in Thailand



Fig. 2 Thailand energy strategies during 2008-2011

Some countries expected that ESCOs will be a successful model for the private sector delivery of energy-efficiency technologies and services, primarily to large institutional customers [2]. The ESCO business has been developed since 1990s. However, a growth rate of this business was not met to a target of several countries. There are some significant reasons why the ESCOs activities were not popular especially in developing countries. As the new business model, established ESCOs were less confidence from the customer point of view. Moreover, the successful demonstrable projects were also not substantial for the target sectors. The most important of obstructed factors was a poor awareness of energy efficiency from public. For Thailand, ESCOs was first established in 1999 under the pilot project of Thailand Promotion of Electricity Energy Efficiency (TPEEE). In this project, there was a cooperated business development between the electricity generating authority of Thailand (EGAT) and the World Bank. The project consisted of a five-year demand side management (DSM) plan.

The outcomes of DSM project change the consumer behavior, improve in the strength of ESCO and financial organization. At that time, the support from World Bank for ESCO pilot project was not only emphasized in preliminary audit, the intensive training programs provided by experts on all areas related to ESCO business were also obtained. However, the economic growth from industrial and commercial sector are directly affect to the energy consumption. The energy conservation and efficiency

programs in target sectors are sectors are not effective implement. The common barriers of energy conservation and efficiency actions in target sectors especially in industrial sector and commercial sector are summarized as following;

- lack of qualified expertise and consultants;
- perception of risk (ESCO is new business and lack of confidence and trust);
- unfamiliar new technology of high efficiency equipment;
- enforcement of energy law and regulation;
- Time delays in project implementation (Project prioritization);
- lack skill for technical and practical in energy conservation programs and;
- lack of financing for investment in energy conservation and energy efficiency.

To eliminate barriers of energy conservation actions, ESCO business is developed to overcome the restrictions from customer perspectives and to promote investment in energy efficiency projects in the private sector especially in the industrial and commercial sector [3]. However, some common barriers to development of ESCO activities are reviewed in reference [4].

## II. THE ROLES AND ACTIVITIES OF ESCO IN THAILAND

ESCO activities are similar to the concept of project management which widely well known. The roles of ESCO in energy management system can be described in seven steps.

- **Pre-measurement:** in this phase, the energy consumption and the energy efficiency of current situation in customer process are measured. The measurement covers the individual machines and equipment assessment and the whole processes assessment.
- **Project Analysis:** to determine the gaps for improving energy consumption and the energy efficiency, the results of pre-measurement are analyzed by using the reference standards. In this phase, the energy efficiency target and plan, as well as engineering conceptual design are the structured.
- **Project Proposal:** the reports of pre-measurement, the project analysis, the target and plan of energy efficiency projects are prepared in project proposal.

▪ **Energy Performance Contracting (EPC):** after the project proposal is agreed by customers, the energy performance contracting arranged by three options as guaranteed saving, shared saving and consultant agreement which will be discussed in the next section.

▪ **Implementation:** the project implementations of ESCO business including equipment procurement, installation, construction, controlling and maintenance are executed as the commitment in the energy performance contracting.

▪ **Measurement and Verification:** the post-measurement and verification is accomplished to compare with the target in the energy performance contracting after the energy efficiency projects are implemented. The benefits between ESCO and customer will be determined as the signed in the contract.

▪ **Intensive Training:** after the project is verified, the in-house training is the last activity to ensure that customers are able to maintain the energy efficiency as the target defined in contract.

### III. ESCO BUSINESS MODELS

In generally, there are two options of energy performance contracting for ESCO business which are shared saving model and guaranteed saving model. Another possibility is the third party funding (TPF) in which a financial institution or bank allows a credit either to the ESCO or directly to its client back by a guarantee for the project energy or cost saving.

#### A. ESCO Shared Savings Model

The ESCO is the important player for shared saving model. In this option, the project investment is carried by ESCO. The customers will be responded for service charge and the actual energy saving will be shared between ESCO and customers. If an actual energy savings is lower than the guaranteed savings, ESCO will be responsible to reimburse the deficit savings. Nevertheless, at the end of project period, customer will be the owner completely. In this financial model, ESCO carries both performance risk and credit risk. The flowchart of shared saving contract is shown in Fig. 3. A shared saving concept is a good introductory model in developing markets because customers can be minimized a financial risk<sup>[5]</sup>.

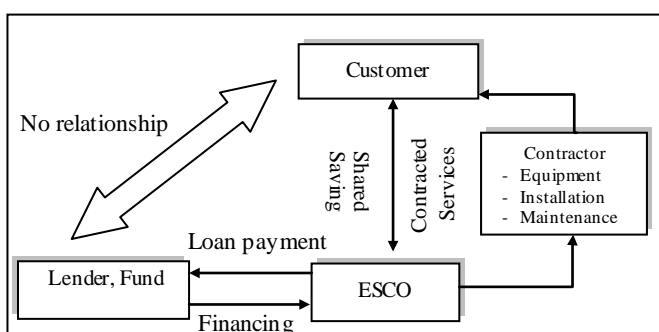


Fig. 3 Typical shared saving contracting

- **ESCO Guaranteed Saving Model (or Customer's Debt Financing Model):** the investment in this contract is provided by the customer with the savings are guaranteed by ESCO. If the project operates with noncompliant of saving guarantee, ESCO will responsible to reimburse the deficit savings as the guaranteed savings performance. The concept of guaranteed saving model is illustrated in Fig. 4 which customer carries credit risk while ESCO carries the performance risk as well as the customer.

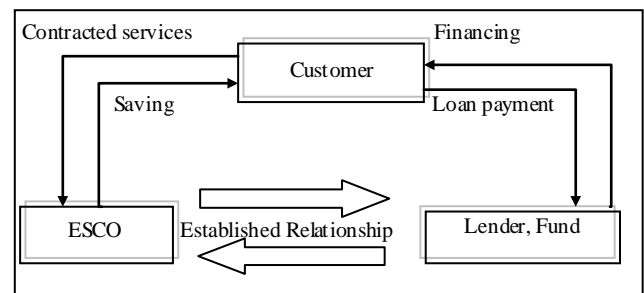


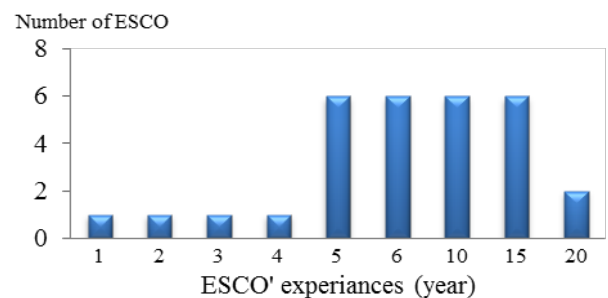
Fig. 4 Typical guaranteed saving contracting

From the first stage of ESCO in Thailand since 1999, there are about thirty ESCOs in 2009 as shown in Fig. 5. Most ESCO industries have experiences in energy conservation and efficiency projects at least 5 years. However, a number of ESCO shown in Fig. 6 indicated that a growth of this business is not relevant to the trend of energy consumption. Some major barriers affected to ESCO activities including enforcement of uncertain energy conservation laws and regulations, low price of energy, reliability and confidence of ESCO industry, financing institution. Last and most important is the lack of information and understanding of opportunities that energy efficiency offer. Therefore, ESCO business can be developed, if appropriate strategies are taken<sup>[6]</sup>.

#### IV. THE POTENTIAL OF COMPANY TO BE AN ESCO IN THAILAND

There are a variety of companies which intend to grow with ESCO business in Thailand. Those are:

- thai company related energy consultant, equipment manufacturer and turnkey contractor;
- entrepreneurs interested in energy conservation industry and professionals in related fields;
- consultant or ESCO from abroad companies;
- equipment manufacturer related to energy saving, energy conservation and energy efficiency from aboard.



Source: Thailand ESCO information center

Fig. 5 Number of ESCO in Thailand (2009)

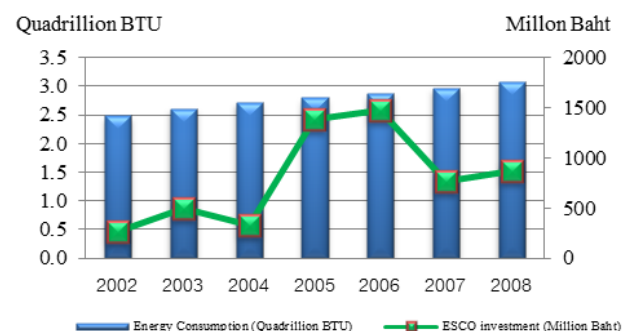


Fig. 6 The trend of energy consumption and ESCO investment

## V. STRATEGIC MANAGEMENT OF ESCO IN THAILAND

In this paper, the activities of ESCO in Thailand are reviewed to explore the development of ESCO business. The strategic management of ESCO business to enhance the energy management system in Thailand is assessed by considering the roles of government, the organization (industries and buildings) and the ESCO. Furthermore, the future market analysis of ESCO business in Thailand is also presented.

### A. The Government Acts as the Driving Force Player

#### 1) Law and Regulation:

Although the first energy conservation law was announced since 1992, the energy conservation projects are still not effective to implement in the large scale of target sectors. From the current directive of energy policy, the laws and regulations of energy conservation will be more effective to implement the energy conservation actions as the plan and targets commitment. The enforcement of energy law for the designated factories and designated buildings will enhance the growth of ESCO business in Thailand. In this case, the ESCO with guaranteed saving contract is expected to be the highest feasibility for ESCO business in enforcement environment. The reason to support this assumption is the designated factories and the designated buildings require the achieved results of energy conservation actions as the commitment in plan and target that comply with the ECP Act. The ESCO with shared saving contract is assessed that it is an option but not for all target sectors. The ESCO with consultant contract is expected that it is low opportunity to growth in the regulation enforcement environment. In the past experiences, the role of consultant was sometime provided only technical information. The effective decision of energy conservation actions were depended on customer's attitude. It is cannot to guarantee the performance of energy saving. However, the role of ESCO with consultant contract is dominant player in the current of Thai energy law.

#### 2) Financial (Fund, loan and Tax):

The financial support is the key success of ESCO. In 2010, most fund and soft loan are provided by 11 financial banks to drive the energy conservation projects and the growth of ESCO business. The results of large investment in energy conservation and efficiency programs with the measure of soft loan are forecasted that the ESCO with guaranteed saving and shared saving will be the dominant players to drive a growth of ESCO business. ESCO fund is one of the measures from government support. Without this measure, we can predict that a number of ESCO businesses in Thailand will be very difficult to increase.

### B. The Organization Act as the Driving Force Player

#### 1) Clean Development Mechanism (CDM) :

The industrial and commercial sectors in today are well aware in the environment impacts. The global market mechanism enforces the products and services from private sector to reduce the emission from raw material to finished products. Many industrial investors in Thailand come from the Annex I countries such as Japan, Germany, Sweden, Switzerland, France and etc. These countries have a responsibility to reduce the greenhouse gases emission by approximately 5.2% of the base level in 1990 during 2008–

2012. Therefore, some industries under the Annex I country's management have an opportunity to implement the CDM project in their industries. The energy consumption reduction projects in the industries can be converted to the greenhouse gases emission reduction under the categories of manufacturing industries. To support the target of CDM project, ESCO with guaranteed saving contract is evaluated that this option has the highest feasibility to involve the CDM project. A reason to support this assumption comes from benefits of CDM projects which are directly delivered to the customers. Therefore, the role of ESCO with shared saving contract and consultant contract are expected to grow as well as a number of CDM projects.

#### 2) Carbon Label:

A Carbon label is one of the new market mechanisms which help the public participation in promoting and motivating consumers to create a low carbon society to prevent global warming. Applicable for a manufacturing process that can achieve greenhouse gas emissions reduction at least by 10 percent in the recent year compared to its emissions in the year 2002. The estimation of the reduction is derived from 3 major carbon emission contributors: electricity consumption, fuel consumption and wastes treatment. Therefore, the capability of ESCO can offer the opportunity for the organization who expects to reduce the energy consumption both electricity and fuel consumption and achieve the emission reduction target. The carbon label project is evaluated that the ESCO with guaranteed saving contract and consultant contract will be the key driver for carbon label project. The new products market trend and environment concerned caused the ESCO is still slowly growth in carbon label.

### C. The ESCO acts as the Driving Force Player


































#### 1) Equipment Manufacturers:

Some of ESCOs in Thailand are the equipment manufacturers, providers and retailers. The dominant strategy management for these ESCOs is providing guaranteed saving contract which the customers prefer to invest the energy saving program themselves. However, the option of shared saving contract will dominate if new technology of equipment with more efficient are launched and more attractive to customer. The ESCO with consultant contract has less feasibility to growth by driving force from ESCO due to low profit for ESCO.

#### 2) One ESCO's Contract to One Customer:

Customers especially in industrial sector prefer to deal with the professional ESCO which can responsible for total energy management system in industrial processes and their facilities. Most registered ESCO in Thailand specialize in some measures of energy conservation and efficiency. Since the variety of industrial business in Thailand, the challenge of ESCO business in the future is the one ESCO's contract to do the total energy and environment management system. The ESCO with consultant contract has a highest feasibility in the future market. Since the total energy and environment management require more expertise and more experiences from various fields. Moreover, the financial support is obstacle to deal with a large energy and environment project. However, the ESCO with guaranteed and shared saving are expected to grow in the future if the energy and environment markets are effective encouraged from various key players.

TABLE I POTENTIAL OF ESCO BUSINESS BY CONSIDERING THE THREE DRIVING FORCES; GOVERNMENT, ORGANIZATION AND ESCO

Key Players	Description Concept of Measures and Programs	Potential Growth of ESCO Business Based on Energy Performance Contracting (EPC)		
		Guaranteed Saving	Shared Saving	Consultant
Driving Force by Government				
Law and regulation (EPC Act, ISO-energy, Energy code)	The main target groups of the Energy Conservation Promotion Act No. 2 2007 (B.E. 2550), which the government will regulate, supervise, promote and assist are 3,622 designated factories and 2,010 of designated buildings			
Equipment standard; appliances label 5, standard	In 2006, there are 23 types and quality standards of machinery, equipment and materials are announced by the government (DEDE) which cover lighting systems, high efficiency motor, variable speed drive, power transformer, capacitor, high efficient air conditioner, automatic condenser tube cleaning system, electronic thermostat, controller of air supply for			
Tax incentive	The tax incentive measure is applicable for purchasing and import high efficiency machine and equipment (tax incentive cost based). The tax incentive based on the performance of			
ESCO Fund	Invest 10-50% of total project cost in EE/RE projects (limit 50 MB/project) which including ESCO venture capital, equity investment, carbon credit market, equipment leasing, technical assistance and credit guarantee facility. In 2012, the ESCO fund is expected by 3,500 MB			
Low interest rate loan	DEDE provides the low interest rate loan (maximum 4%) through financial institutions, banks to encourage the energy conservation and efficiency programs. The target of low interest loan measure is providing the investment support to ESCO and private sector such as industry, commercial buildings and etc.			
Demand Side Management Bidding Mechanism	The bidding program is intended to the private sectors which are industry, hospital, hotel, resort, department store, office building. The minimum requirements for energy saving are 300,000 kWh/year and 3,500 MBTU/year for electricity and thermal energy, respectively.			
Driving Force by Organizations				
Clean Development Mechanism (DSM) and the outcome from COP15	The Clean Development Mechanism is a cooperative mechanism established under the Kyoto Protocol. CDM was designed to assist industrialized countries in meeting their mandatory greenhouse gas emissions reduction targets, and at the same time, to promote			
Carbon label	The England, France, Canada, Japan, Korea and Switzerland require Thailand to export goods and products with low carbon labeling. The registered criteria of products with carbon label are the reduction of greenhouse gases from 10% of based level in 2002 by			
Maintain the organization profits in fluctuated energy prices (Fuel, electricity)	The cost of energy is an important factor which impacts to the organization profits both industrial sector and commercial sector. The trend of fuel cost and electricity cost are predicted to increase continuously while the organization requires the stabilized profits. The			
Driving Force by ESCO				
Equipment manufacturers	Some ESCOs in Thailand are the equipment and machines manufacturers, providers or retailers. The benefit of these ESCO is to optimize energy management solutions for customers both sale and services			
Customers require one ESCO to do everything about the energy management system	Most of ESCO in Thailand specialize in their experiences such as HVAC system, lighting system, electrical equipment, renewable energy and etc. The energy management system both energy saving program and energy conservation program require ESCO that provide			

 highest feasibility
  high feasibility
  intermediate feasibility
  low feasibility
  lowest feasibility

## VI. POTENTIAL AND OPPORTUNITIES OF ESCO BUSINESS IN THAILAND

The industrial and business sectors are the highest electricity consumers in Thailand accounted by 60% of total Thailand's electricity consumption in 2011. Therefore, the government has adopted the target of energy intensity reduction at least 8% by 2015 compared to 2005 and 25% by 2030. In order to achieve the target setting, Thailand has established energy efficiency improvement programs for industrial sector to reduce the energy demand and promote the efficient use of energy. Several major measures have been introduced such as promotion of energy management, revolving funds, tax incentives, technical assistance, standards and regulations, collaboration with major private corporations. For ESCO business, it is also expected to be an important player for policy achievement. The assessment of ESCO activities by considering driving forces of government sector, organizations and ESCO are presented in this section. Key players derived from energy conservation measures from government supports are set to be variables which impact to the ESCO industry. A business growth rate has been analyzed under benefits of ESCO models by using a feasibility indicator. The summary results of feasibility assessment are illustrated in Table I.

## VII. CONCLUSION

Since 1999, the first energy service company was established in Thailand, after only a decade of continuous development, ESCOs show the impressive performance of successive key point to achieve the target of energy policy on energy conservation and efficiency. The business growth of ESCO in Thailand is situated in the middle developed in 2009. At the present situation of ESCO in Thailand, the growth factors are mostly depended on the government initiatives. After a strong encouragement of energy conservation and efficiency programs by government and ESCO in a past few years, the business of ESCO is expected to continue growth in the future. However, the key success of ESCO business in Thailand depends on strategic management of ESCO under the driving forces of government, organization and ESCO. The keys strategic management under the government is enforcement the law and regulation, the development of financial mechanisms which providing fund and soft loan to strengthen energy efficiency policy. In addition, the key strategic management of ESCO under driving force of organization depends on energy prices which the highest feasibility of energy performance contracting is guaranteed saving contract. Moreover, the key strategic management of ESCO under driving force of ESCO is the role of ESCO with equipment manufacturers while the highest feasibility of energy performance contracting is guarantee saving contract. Finally, the growth of ESCO business in Thailand depends on

strategic management under the roles of government, the customer and the ESCO. For the further study, the strategic management of integrated energy and environmental policy will be studied.

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